

Q1 Discuss the physiological causes of early post operative hypoxaemia (Sept 2010)

Normal PaO₂ in arterial blood = 75-100mmHg (varies with age) Hypoxaemia = low partial pressure of oxygen in arterial blood

CAUSES OF EARLY POST OP HYPOXIA

- Low inspired FiO₂ → remembering **PAO₂ = PIO₂ - PCO₂/R + F**, where PIO₂ = (P_{ATM}-47mmHg) x FiO₂
 - Consider insufficient supply of supplemental O₂, faulty tubing connection, or low barometric pressure if operating at significant altitude

- Hypoventilation → **VA = (TV - dead space) x RR**
 - In the post op patient this may be due to pain, respiratory depression due to drugs (benzos, opioids), paralysis of respiratory muscles (inadequate reversal), chest wall surgery, abdominal distention, bronchospasm, airway obstruction

- Shunt → V/Q = 0. May be anatomical (bronchial venous drainage, intracardiac shunt), or pathological (consider pulmonary oedema, pneumonia).
 - Remember that closing capacity increases with age, equaling FRC at age 44 in the supine position. When CC>FRC, shunt will occur.
 - Loss of hypoxic pulmonary vasoconstriction due to drugs will also contribute to shunt

- V/Q mismatch → unequal matching of ventilation and perfusion. Consider atelectasis, low cardiac output state, PE, aspiration if inadequately fasted

- Diffusion abnormality → as per Fick's law, **diffusion is proportional to SA of diffusion barrier, P1-P2 and diffusion constant, inversely proportional to thickness of barrier** (consider pulmonary fibrosis). Unlikely to develop acutely, but the stress of surgery may worsen pre-existing abnormality.

- High O₂ consumption → **O₂ Extraction Ratio = (CaO₂ - CvO₂)/CaO₂** (consider hypermetabolic state such as sepsis or malignancy, fever, shivering)